

## Patent Claims

1. Method for separating and recovering target polymers and their additives from a material containing polymers,  
  
characterised in that,  
  
a) the target polymer together with at least one additive is dissolved in a solvent I and  
  
b) the dissolved target polymer with the additives is mixed with a non-aqueous solvent II, which is miscible with the solvent I, the target polymer not dissolving in said solvent II, in such a manner that the target polymer is precipitated, whilst the additives remain in dissolved form and  
  
c) the precipitated target polymer and  
  
d) at least one additive present in liquid phase are separated.
2. Method according to claim 1, characterised in that the polymer-containing material contains a polymer mixture, at least one further foreign polymer being dissolved in addition to the target polymer in step a) and the foreign polymers remaining in dissolved form in step b).
3. Method according to one of the preceding claims, characterised in that a solvent system comprising water and a solvent III forming with water a 2-phase system is used in step b) instead of a solvent II, the target polymer being precipitated in the phase formed by the solvent III,  
  
whilst the additive and dissolved foreign polymers remain in this phase in dissolved form.

4. Method according to one of the preceding claims, characterised in that the target polymer dissolved in solvent I together with the dissolved additives is placed in the solvent II or in the solvent system comprising water and a solvent III.
5. Method according to one of the preceding claims, characterised in that the solvent II or the solvent system comprising water and a solvent III is added to the target polymer dissolved in solvent I.
6. Method according to claim 3, characterised in that the target polymer dissolved in solvent I is mixed firstly with the solvent III and then water is added.
7. Method according to one of the preceding claims, characterised in that the target polymer dissolved in solvent I is introduced with a nozzle in step b).
8. Method according to one of the preceding claims, characterised in that, as target polymer, a polymer from the group of polyvinylchlorides, polycarbonates, polystyrenes and copolymers thereof (for example polyacrylnitrile-butadiene-styrene), polyacrylates, polymethacrylates, polyethyleneterephthalates and polyvinyl butyrals is separated.
9. Method according to one of the preceding claims, characterised in that, as additives, halogen-containing flame retardants, such as for example polybrominated diphenylether (PBDE), polybrominated biphenyls (PBB), bis-(dibromopropoxy-dibromophenyl)-propane (OBPE) or bis-(tribromo-phenoxy)-ethane (TBPE) are separated and processed.

10. Method according to one of the preceding claims, characterised in that, as additives, plasticisers, such as for example esters of phthalic acid or adipinic acid and/or aliphatic carboxylic acids (C<sub>4</sub>-C<sub>8</sub>) are separated with polyethylene glycol and processed.
11. Method according to one of the preceding claims, characterised in that the solvent I is selected from the group of low molecular alcohols (C<sub>1</sub>-C<sub>5</sub>), of cyclic ethers (e.g. tetrahydrofuran), of the aliphatic (e.g. acetone, methylethylketone) and cyclic ketones (e.g. cyclohexanon), basic ester mixtures (e.g. DBE) or a mixture of these.
12. Method according to one of the preceding claims, characterised in that the solvent II is a low molecular alcohol (C<sub>1</sub>-C<sub>5</sub>).
13. Method according to one of the preceding claims, characterised in that the solvent III is an aliphatic, e.g. n-hexane, or aromatic hydrocarbon, e.g. toluene.
14. Method according to one of the preceding claims, characterised in that, before step b), the target polymer dissolved in solvent I is separated from the non-soluble components in solvent I by physical separation methods.
15. Method according to claim 14, characterised in that a filtration is implemented as physical separation method.
16. Method according to one of the preceding claims, characterised in that the precipitated target polymer (step c) is isolated by a physical separation method.
17. Method according to claim 16, characterised in that the precipitated target polymer is decanted and/or filtered off.

18. Method according to one of the preceding claims, characterised in that the target polymer is dried after the separation.
19. Method according to claim 18, characterised in that the drying is implemented at a temperature of more than 50°C.
20. Method according to one of the preceding claims, characterised in that the separated and dried target polymer is re-extruded.
21. Method according to one of the preceding claims, characterised in that the additives are recovered by distillation of the solution in step d).
22. Method according to one of the claims 1 to 20, characterised in that, in step d), the additives present in solution are recovered by chromatographic separation methods, such as for example ion-, partition- or adsorption-chromatography.
23. Method according to one of the claims 1 to 20, characterised in that, in step d), the additives present in solution are recovered by membrane separation methods.
24. Method according to one of the preceding claims, characterised in that, in step d), the halogens are recovered from the halogen-containing additives present in solution by reduction of the flame retardants.
25. Use of the method according to one of the claims 1 to 24 for the reprocessing of plastic materials and/or plastic material-containing materials which contain halogens.

26. Use of the method according to one of the claims 1 to 24 for the reprocessing of plastic materials and/or plastic material-containing materials which contain plasticisers.
27. Use of the method according to one of the claims 1 to 24 for reprocessing plastic materials or plastic material-containing materials which contain polyvinyl butyral for subsequent production of glass shatter-proof materials for flat glass, as implosion- and explosion protection materials for laboratory glass, soundproofing composite metal sheets or polymer coatings for sintered porous glass plates and shapes.